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PATENT APPLICATION

ATTORNEY DOCKET NO: OBJ-2880

Sub Spec. Part of #10

TITLE OF THE INVENTION

SPINNING DEVICE FOR FORMING A THREAD FROM FIBERS

The invention relates to a method and device for the manufacture of a spun thread from a fibre structure wherein fibers are subjected to a rotating air flow at the intake mouth of a spindle yarn channel to form a thread.

BACKGROUND

Such a device is known from DE 4431761 C2 (US 5528895) and is shown in Figures 1 and 1a. Therein, fibres F' are guided through a fibre guide channel 113 from a fibre guide surface 104b via an end edge 104c of a fiber guide cone 104 and around what is referred to as a needle 105, into a yarn aperture 107 of what is referred to as a spindle 106, whereby the rear part of the fibres F' are wound around the front part of the fibres F' already located in the yarn passage by means of a turbulent flow created by nozzles 103, as a result of which a yarn is formed. This is then spun in accordance with a method which is described in connection with the invention.

The item referred to as the needle 105, and its tip, about which the fibres are guided, is located in the vicinity or in the intake aperture 106c of the yarn passage 107, and serves as what is referred to as a false yarn core, in order to prevent as far as possible, or to reduce, the possibility of the fibres in the fibre guide channel causing a false twist to the fibres, impermissibly high for the fibres concerned and leading to snarling, which at the least will interfere with the formation of the yarn if not preventing it altogether.

Figure 1b shows the prior art know from DE 4131059 C2 (US5211001), which suffers from disadvantages in comparison with the invention from DE 4431761 C2, in which, as is known from Figure 5 in DE 4431761, the fibres F' are not consistently drawn around the needle 105', as Figure 1a shows, but are guided on both sides of this needle 105 against the intake aperture of the yarn passage, which apparently may interfere with the binding of the fibres F' and apparently may reduce the strength of the spun yarn.

Figure 1c shows a further development of the invention from Figure 1a, in which the fibre guide surface is designed, as can be seen, in helical form, and the fibres are accordingly likewise guided in helical manner in their course from the clamping gap X' as far as the end e5' of the helical surface, and are then again wound in helical fashion about a fibre guide pin, similar to the needle of Figure 1, before the fibres are taken up by the rotating air flow and rotated into a yarn Y'. In this situation, it can be seen that the free ends F1' of the fibres F' are taken up by the rotating air flow and bent around the mouth section of the spindle 206, and in this situation are wound around the ends incorporated in the fibre bundle, which are already located in the center of the fibre run, in order in this way to form the yarn. Figure 1c derives from DE 19603291 A1 (US 5647197). Only the spindle 206, the yarn passage 207, and their air extraction cavity 208 of Figure 1 were adopted herein, while the element e2', which has a similar function to the needle 105 of Figures 1 to 1b, was left thus.

It can be seen from these figures that the primary aim of the prior art lay in avoiding a false twist of the fibre bundle from the spindle back to the clamping point X', but, on the other hand, it can also be seen that the fibre flow must be designed in such

a way that free ends, to advantage the rear ends seen in the direction of the run, are available in order to be wound around the part of the fibre already located in the yarn passage, in order thereby to form the yarn Y'.

It was not the object of the prior art to have available at the intake aperture of the spindle sufficient, and sufficiently long, free ends in order to wind them about the ends located incorporated in the core, in order to obtain a yarn of sufficient quality.

A further prior art from the same applicant as that of Figures 1 to 1c is described in DE 42 25 243 (US5295349) and shown with Figures 2 to 2c, in which account is taken of the situation last referred to, and appropriate preventive precautions taken to separate the free (rear) ends of the fibre better for twisting by the rotating air flow. This was achieved by the fact that the fibre bundle is divided into at least two parts, also referred to as fibre strips, by way of a channel being provided for each part, which end before reaching the said needle 305 or the cone 304 respectively, as shown in Figures 2 and 2a. In Figures 2c and 2b, an example is shown with two channels created by element 318a, whereby, according to the description of this patent specification, this may involve two closed channels in each case, by contrast with Figure 2b and 2c, in which a connection is provided between the channels.

The disadvantage of this prior art, however, still lies in the unsatisfactory differentiation between core fibres and winding fibres from the fibre bundle delivered from the output rollers of a drafting device, in order to ensure that sufficient wound fibres, or sufficient free ends, are available for the winding.

Accordingly, the same applicant has disclosed, in the Japanese applications J7-173727 and J7-173728, a spinning device (see Fig. 3 and 3a) which on the one hand

features two channels, specifically one channel 405a for core fibers and one channel 405b parallel to this for winding fibres. The special feature of this lies in the fact that core fibres are falsely twisted by means of a twisting medium (air) present in fibre channel of the spindle 404, as far back as the clamping point X' of the rollers delivering the fibre bundle, and specifically in such a way that the certain fibres are not taken up by this false twisting effect, and are delivered in the parallel channel 405b against the intake aperture of the spindle.

Figs. 3 and 3a further show a longitudinal section through a spinning device with a thread guide channel 405a and a second parallel thread guide channel 405b.

In the fibre guide channel 405a, on the one hand, a false twist is incurred by the rotating air flow N1' and, on the other, a false twist into a core fibre strand supported by the twist nozzle Na', which extends from the intake of the spindle 404 as far as the clamping gap X' of the two clamping rollers 402.

Delivered around this extended core fibre strand fa' are fibres fb' raised from this, in the separate, i.e., parallel channel 405b, against the intake aperture of the spindle 404, which are taken up at that point by the circulating air flow N1', and turned about the falsely-rotated yarn core, and in this way producing the yarn characterized as Y'.

If the prior art of Figures 1 to 2c are compared with this prior art, it can be seen that the basic principle, that of avoiding a false twist as far back as the clamping gap, is sacrificed in this prior art in favour of obtaining a division into core fibres and sheath fibres.

The disadvantage of the latter prior art, however, lies in the fact that it is difficult, with the pure provision of twist to form the false fibre bundle, to obtain the correct

number of peripheral fibres, and that, on the other hand, false-twisted fibres are no longer in a position to release ends about which the incorporated ends can be wound, with the result that there remains an indeterminate provision of peripheral fibres for the formation of the yarn.

It is further mentioned in DE 4131059 C2 that an interval is provided between the intake aperture of the spindle 206 and the clamping gap X', designated in Figure 1c by B', greater than half the mean fibre length but smaller than 1.5 times the mean fibre length, in order on the one hand to obtain sufficiently long fibre ends for the winding, and, on the other, not to release these fibre ends too early from clamping in the clamping gap X'. The disadvantage arises on the one hand in the somewhat vague concept of the mean fibre length and, on the other, in the large range between the half of the mean fibre length and one and a half times the length.

SUMMARY

It is therefore a principal object of our invention to obtain core fibres and sheath fibres in such a way that an optimum number of fibres can be obtained with an optimum winding length. Additional objects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

The invention resolves this object in accordance with the characterization of the first independent method claim and first independent device claim.

Further advantages embodiments are described in the dependent sub-claims.

The advantage of the invention lies in the fact that with more than one interval between the clamping line of the output pair of rollers, or the fibre discharge line of the

suction drum and intake aperture of the spindle, more fibres reach the binding area with their front or preceding ends before the not yet integrated, preferably rear ends, seen in the direction of the run of the fibre, have left the clamping line or the fibre discharge line, in order thereby to optimize better the winding length.

Generally spoken, “rear”- or “front”- ends are not limiting terms and refer to “not yet integrated” and “preceding” ends, respectively.

BRIEF DESCRIPTION OF THE FIGURES

The invention is presented in the embodiments of the following figures. These show:

Fig. 1: A longitudinal section through a spinning device from DE 4431761 C2.

Fig. 1a and 1b: One figure each from the aforesaid DE specification.

Fig. 1c: A figure from DE 19603291 A1.

Fig. 2: A longitudinal section through a spinning device from DE 4225243 (corresponds to the preamble from the first claim of the present invention).

Figs. 2a to 2c: Further details from DE 4225243.

Fig. 3: A longitudinal section through a spinning device from JP 173727 and JP 173728 (corresponding likewise to the preamble to the first claim of the present invention).

Figs. 4 and 4a: One longitudinal section each through a drafting device and through a spinning device as a basis for the representation of the following Figures 6 to 6c and 7 to 7c representing the invention.

Fig. 5: A longitudinal section through a spinning device from the patent application CH 2000/1845/00 of 22 September 2000 from the same applicant as a basis

for the presentation of the following Figures 6 to 6c and 7 to 7c representing the invention.

Fig. 5a: A cross-section through Fig. 5, corresponding to the section lines II-II.

Fig. 5b: A section through Fig. 5, corresponding to the section lines I-I.

Fig. 5c: A part of the section of Fig. 5b, to represent special features.

Figs. 6 to 6c and 7 to 7c: In each case a longitudinal section, corresponding to Fig. 5b, in each case through a spinning device according to the invention.

Fig. 6.1, 6c.1, 7b.1, and 7c.1: In each case, a selected figure from the foregoing figures in order to emphasize certain features.

Fig. 8: Variants of the drafting device from Fig. 4.

Fig. 8a: Detail from Fig. 8.

Fig. 9: A variant of the device from Fig. 4a.

Fig. 10: A longitudinal section from a yarn according to the invention.

DETAILED DESCRIPTION

Reference will now be made in detail to the presently preferred embodiments of the invention, one or more examples of which are shown in the figures. Each example is provided to explain the invention, and not as a limitation of the invention. In fact, features illustrated or described in one embodiment can be used with another embodiment to yield still a further embodiment. It is intended that the present invention cover such modifications and variations.

The invention is described hereinafter. It is therefore noted that the identification references for the following figures have no relationship to the features of the prior art, and vice-versa.

Fig. 4 shows a drafting device 1 with four drafting rollers (two partially shown) and a pair of small drafting device belts, which convey the fibres between an upper clamping roller 2 and a lower clamping roller 3. Clamping rollers 2 and 3 in their turn convey a fibre strip 7 against a fibre conveying channel 8, through which, by means of an injector effect provided by blow-in nozzles 9, air is sucked in and the fibre strip 7 is brought into the fibre conveying channel 8.

At the outlet of the fibre conveying channel 8, the front ends of the fibres of the fibre strip are taken up and wound around the rear free ends in an inherently known manner, which are rotated by means of the air vortex referred to, as a result of which a yarn is provided and unwound at a specified unwinding speed. It should be noted in this context that throughout the term "front" and "rear" ends of the fibres relate to the direction of run of the fibres.

The fibre conveying channel is part of the fibre conveying element 10, which as shown, is located in carrier element 37 and is capable of replacement.

Fig. 4a shows, as a variant, instead of the lower clamping roller 3, a suction roller 4, by means of which the fibres are conveyed from the clamping gap between the upper clamping roller 2 and the suction roller 4 as a fibre strip 7 against the fibre conveying channel 8, and at that point, as described heretofore, are taken up by the air flow. The further procedure for the formation of the yarn corresponds to the procedure in Figure 4.

A suction area 5 is provided in the suction roller 4, by means of which air is sucked in from outside the suction roller 4, and in this situation the fibres are held on the surface and conveyed by the rotation of the suction roller 4 against the fibre conveying

channel and then released again at the end of the suction area at a fibre discharge point P. The air of the suction area 5 is drawn in through a suction aperture 6.

Fig. 5 to 5c correspond essentially to Figs. 2 to 2b and 2.1 to 2b.1 of the application mentioned earlier (CH 2000/1845/00), which are integrated constituent parts of this application or are at least referred to therein.

Fig. 5 represents in diagrammatical form, by means of a line, a suction roller 539, analogous to the suction roller 4 of Fig. 4a, which, however, in contrast to Fig. 4a, delivers the fibres F' into the fibre conveying channel 526 not from top to bottom but from bottom to top. In this channel, the fibres are conveyed in the conveying direction 525 on the fibre guide surface 528 as far as the fibre delivery edge 529, shown in Fig. 5c. After this fibre delivery edge 529, the front ends of the fibres F' are bundled in the spindle intake aperture 535 in an area designated at N", and are conducted into the yarn guidance channel 545, while the rear ends 549 of the fibres F' are laid around the spindle 532 and rotated by the rotating air flow created by the nozzles 521, as shown in Fig. 5 and 5b, as a rule around the mouth section of the spindle 532, with the result that the rotation of these free ends results in a yarn 546 with real twist.

The fibre conveying channel 526 is part of a fibre conveying element 527, which is incorporated in a replaceable manner in a carrier element 537. The carrier element 537 is permanently integrated on the other side into a nozzle block 520.

The cross-section of Fig. 5 in Fig. 5a shows the same elements. It can also be seen that there are four nozzles 521 involved, which create the rotating air flow for the free fibre ends.

It can be seen from Fig. 5b that the fibres F' gradually bind together from one fibre take-up edge 531 to another take-up edge 529 (Fig. 5c), and, specifically because of the movement of the fibres and the bundling effect of the fibres located in the yarn guide channel 545, they bind together into a fibre binding and winding area designated as the bundle point N".

As mentioned in CH 2000/1845/00 referred to heretofore, the spinning process must commence with a spinning start process, in order for the front ends of the fibres to be actually taken up into the spindle intake mouth 535. On the other hand, it is also essential that sufficient free rear ends of the fibers are obtained in order for these ends, as designated with the identification reference 549, to be able to lie about the spindle front surface 534 (Fig. 5c) and to rotate thereon, in order for the binding-in process to take place.

Figure 10 shows in diagrammatic form a section from a yarn 46 with a front fibre end 52 bound in and a rear fibre end 51 wound around, which surrounds the yarn body 55 by a winding length 54. The direction of run of the yarn is designated by 53.

This process is essentially already described in the patent application referred to heretofore, and further comment at this point is therefore refrained from.

The obtaining of sufficiently long free ends depends on the one hand on the length of the individual fibres, which is determined under laboratory conditions in what is referred to as a staple diagram, and, on the other, from the distance between the clamping line K of two clamping rollers 2 and 3, as shown in Fig. 4, or the fibre discharge point P at a suction roller 4, as shown in Fig. 4a and the spindle intake mouth

35 of the spindle 32. These two intervals are also designated here as the "clamping length".

In order on the one hand to improve the obtaining of sufficiently long free ends, and, on the other, to reduce the dependence on the clamping length referred to, according to the invention, as shown in Figures 6 to 7c, the fibre flow is divided into at least two parts, whereby the one part is considered primarily as what is referred to as the short or core yarn fibres part, and the other part primarily as what is referred to as the long or cover yarn part, in order, by means of better adaptation to the clamping length and the winding length 54, to improve the uniformity and strength of the yarn. The two terms referred to, "short or core yarn fibres part" and "cover yarn part" were created for this description and are not to be regarded as general technical terms.

In this situation, in the spinning start process referred to, the yarn end guided by the spindle backwards against the output rollers of the drafting device or against the suction roller is conducted into the core yarn fibres part.

As a rule, the core yarn fibres part involves an essentially extended channel, i.e. a channel without bends through which core yarn fibers F_3 are conducted, while the cover yarn fibres F_2 are more usually conducted in the channel with bends, i.e., is conducted in the cover yarn part. If three channels are used, as a rule the middle channel is the core yarn fibres part. The two outer channels, provided with a bend, may feature the same or different bending, in order to achieve a different mean conveying length (24 to 24.11) and a different impact angle α or β respectively. In this situation, as shown by Fig. 6.1, 6c.1, 7b.1 and 7c.1, the angle α converges on the bundle point N (N.3, N.6, and N.7) in which the middle conveying lengths cross at a tangent T imposed

at a bent middle conveying length 24, and by the mid-line 47 of the spindle. The angle β is enclosed on the one side by the mid-line 47 and either by a middle conveying length 24 or by a tangent T.1 in the bundle package N (N.3, N.6, and N.7) at a middle conveying length.

In this situation the different middle conveying lengths in the four figures referred to are designated in brief only as 24.

In addition to this, the bent movement results in a greater conveying length in relation to an extended middle conveying length, with the result that the front ends of fibres of equal length, which enter the corresponding channel at the same time, while moving at the same speed do not reach the bundling point N referred to at the same time, due to the differing conveying length. That is to say, the front end of the fibre on the shorter path is bundled earlier than the other fibres on the longer path. If the possibility is also taken into account of being able to obtain different speeds because of different channel cross-sections, then the possibility also pertains of achieving a temporal difference for the attaining of the binding area of the two fibres. Expressed another way, there is the possibility of several adjacent distances being obtained between the clamping line K (as seen in Figs. 4, 6 and 6b) or a fibre discharge point P at the suction roller (as seen in Fig. 4a) and the bundling point N. That is to say, there is a greater range of the distances, in order better to adapt the length mixture of the fibres in the fibre bundle.

In addition, there are fewer "floating" fibres, i.e., fewer fibres which are no longer held back and are not bound in at the front, which reduced fibre loss due to outgoings.

Moreover, the impact angle α (designated as such for this application) or β respectively has a certain tendency to release the rear ends, since to a certain extent a preliminary effect in geometric terms has already been carried out for these ends to be kept free.

A further possibility pertains in designing the cross-section of the channels in such a way that the channel is widened in cross-section towards the end, i.e., in the direction of the bundle point N, in such a way that a delay occurs in the air flow, the consequence of which is that the fibres have a tendency to be positioned transverse to the direction of conveyance, as a result of which the rear ends have a tendency to reach the bundle point or the binding-in area referred to, at a greater angle than the angle α or β respectively.

In Figs. 6 to 7c, different variants are therefore shown in order to take appropriate account of the aspects referred to heretofore.

Fig. 6 shows the suction roller 4, in which an intermediate element 16 subdivides the suction roller into a left-hand suction part 12, seen in the direction of conveying 11, and a right-hand suction part 13, so that a fibre strip from the clamping line K in the conveying direction 11 is divided into two parts, and specifically in a width which accords with the corresponding intake widths of the following fibre channels 14 and 15.

Shown in the channel 14 is a middle conveying length 24.12 and in the conveying channel 15 a middle conveying length 24.13, whereby, as can be seen, the length 24.12 is greater than the length 24.13. Both lengths meet at the bundling point N, which is always located inside the spindle intake mouth 35 of the spindle 32,

essentially in the same area. Despite this, the individual bundle points N are individually numbered with an index number.

For the start of spinning, the yarn end referred to earlier is guided back through the channel 15 onto the suction roller 4. Accordingly, care must be taken to ensure that fibres in the channel 14 reach their destination location as far as possible without loss, as a result of which a guide wall 33 is provided for as far as the fibre discharge edge 29.

The same applies to Fig. 6a with the guide wall 33.1. In this variant, the angle α shown in Fig. 6b is greater than that in Fig. 6; i.e. in this case, what is referred to as the angle effect is required to be somewhat stronger than in Fig. 6.

In principle it should be repeated that the fibre conveying elements 27, 27.1, 27.2, 27.3, and 27.4, in which these channels are inserted, are capable of being exchanged; that is to say, the channels can be adapted to the corresponding fibre material.

In principle, the optimum width ratio of one channel to the other, the optimum ratio of the middle conveying lengths, and possible the optimum location of the bundle point N and the optimum angle α and β must be determined empirically, depending on the fibre mixture, for all variants of the figures shown.

The channels of Fig. 6, Fig. 6a and Fig. 6c are all formed in such a way that the air, and the fibres respectively, undergo a predetermined acceleration from start to finish, while in the channel 14.2 of Fig. 6b, it is primarily an acceleration of the air which takes place as far as the culmination point of an intermediate wall 38.2, while thereafter, as far as the end of the channel, due to the widening of the channel itself, the air flow is slowed down in a predetermined manner, in order to obtain the effect referred to earlier;

namely, that the fibres tends to move in the transverse direction to the channel. On the other hand, the acceleration of the fibres has the advantage that the fibres reach the node point stretched and essentially in this position.

In principle, in the figures elements with the same functions are provided with the same basic identification references, and an additional index number corresponding to the figure; for example, the conducting wall 33 from Fig. 6 in Fig. 6a is a "conducting wall 33.1".

In Figs. 6 and 6b and 7 and 7b, a suction roller 4 is shown in each case. There is also the possibility, however, of the fibre bundle being delivered from a drafting device, whereby in such a case the fibre bundle must already be divided into the two parts desired in the drafting device. The same applies to Figs. 6a and 6c and 7a and 7c, in which no suction roller is shown, but which could likewise be used.

Figs. 7 to 7c feature as variants three channels instead of two, whereby the angles of incidence α and β may optionally be the same or different for the channels (14.4, 14.5, 14.6, and 14.7) and (15.4, 15.5, 15.6, and 15.7), depending on the fibre material, while the middle channel (23, 23.1, 23.2, and 23.3) as a rule features a middle conveying length (24.1, 24.4, 24.7, and 24.10) which is located as a rule in the same plane as the middle line 47 of the spindle 32. In this situation, this plane is located perpendicular when looking at the figures.

Corresponding to the three channels, the suction roller 4 in Figs. 7 and 7b is additionally provided with a middle suction part 19. The suction parts 12.1, 13.1 and 19 are subdivided by the intermediate elements 17 and 18.

The guide walls 33.4, 33.5, 33.6, and 33.7 are conducted as far as the fibre discharge edge 29, in order to guide the fibres in such a way that, as mentioned earlier, they can be taken up in the binding-in area practically without loss.

In Figs. 7and 7a, the fibre conveying channels are designed in such a way that the air, and therefore also the fibres, undergo acceleration from the beginning to the end, while the conveying channels of Fig. 7b are of such a nature that the air in the middle channel accelerates while the air in the outer channels is slowed down in the end area.

In Fig. 7c, the air in the channel 14.7 and 23.3 features an acceleration, while that in the channel 15.7 undergoes slowing in the end area.

All variants of Figs. 6 to 7c are only examples for realizing the aspects of the invention mentioned in the preamble, as a result of which the invention is not restricted to this, other variants also being conceivable within the scope of the concept of the invention.

With the Figures 6.1 to 7c.1, the angles α and β and the channel cross-sections A, B, and C are shown. This is intended to show that in Fig. 6.1 the channel 14 (see also Fig. 6) undergoes widening to C after the cross-section B being narrower than A. The same applies to the channels 14.6 and 15.6 in Fig. 7b.1 (see also Fig. 7b) and to the channel 15.7 in Fig. 7a.1 (see also Fig. 7c).

The difference between the angles α and β is clearly shown in Figures 6.1 and 6c.1, while in Fig. 7b.1 α and β are about the same size, and in Fig. 7c.1 α is a little greater than β.

The figures show variation possibilities; the effective values must be determined from case to case.

It may further be mentioned that more than one fibre bundle F_2 and F_3 can be delivered from the drafting device or from the suction roller 4 as seen in Figs. 6 and 6b, in order to obtain differences in the middle fibre lengths in the corresponding fibre bundles.

If more than one fibre bundle is delivered from the drafting device or the suction roller, the possibility likewise pertains of delivering not only different fibre lengths but also different fibre types per fibre bundle; i.e. the synthetic fibres, which are longer, for example, can be delivered in that channel which features the longest conveying length, while the staple fibres are delivered to the channel(s) which feature(s) shorter conveying lengths.

The possibility also exists of delivering the synthetic fibres in that channel which features the shortest conveying path, and thereby tends to deliver core fibres rather than the channel with the longer conveying path delivering staple fibres, which then take over the function of the sheath fibres, with the result that a yarn features essentially synthetic fibres in the core and staple fibres in the sheath.

It is possible, in particular, if three channels are used, for the synthetic fibres to be conducted in the middle channel and the staple fibres to be conducted in the outer channels. In this situation, however, it must be borne in mind that the conveying lengths of the outer channels feature a size adapted to the staple fibres. It does not matter in this context that the inherently longer synthetic fibres in the center feature a shorter conveying path than the staple fibers.

Figs. 8 and 8a show a variant of Fig. 4, in that, in addition, a tension roller 43 is provided for, which is provided with a roller part 43.1 and a roller part 43.2, whereby the roller part 43.1 features a smaller diameter than the roller part 43.2. In this situation, the roller part 43.2 is located with the circumference on the fibre guide bottom of the fibre conveying channel 8.1, while the roller part 43.1 with the smaller diameter results in a gap, corresponding to the diameter different, between the circumference of the roller 43.1 and the bottom of the fibre conveying channel 8.1, so that the fibres in this area have a free passage from the clamping line K to the intake mouth of the spindle 32, which is characterized by the distance interval M.

On the other hand, the roller part 43.2 forms a clamping line K.1 with the bottom of the fibre conveying channel 8.1, with the result that an interval M.1 pertains between this clamping line and the intake mouth of the spindle 32.

With this variant, the possibility pertains of relatively short fibres being delivered and spun in, the rear end of which is still clamped in the clamping line K.1, while the front end is already bound into the mouth of the spindle 32.

This variant accordingly shows a further possibility of varying middle conveying lengths in addition to the variants shown in Figs. 6 to 7c.

In this situation, elements are provided with the same identification references as in Fig. 4.

The tension roller 43 is driven by means of a overhead drive 44 from the shaft of the clamping roller 2 in such a way that the circumferential speed of the tension roller 43.2 corresponds to the circumferential speed of the roller 2.

The difference between the diameter roller parts 43.1 and 43.2 is of such a nature that the fibre flow between the clamping line K and the mouth of the spindle 32 on the bottom of the fibre conveying channel 8.1 is not disturbed.

Fig. 9 shows a variant of Fig. 4a, in which the same elements feature the same identification references and accordingly are not described again.

The variant to this figure consists of the fact that a tension roller 43.3 is provided for, which presses against the circumference of the suction roller 4, in order to form a clamping line between the circumference of this roller and the circumference of the suction roller 4, in order for the release of the fibres from the suction roller 4 into the fibre conveying channel 8.1 to take place in a predetermined and not variable manner.

The roller 43.3 is spring-supported, which is represented by the symbolic spring 50.1. The same applies to the tension roller 43 in Fig. 8, whereby in this case the spring is designed by 50.

The variant of Fig. 9 is combined with the channels shown in Figs. 6 to 7c.

The drive for the roller 43.3 is provided by the suction roller by means of the friction between the surface of the tension roller 43.3 and the fibre bundle 7, which features a friction relationship with the surface of the suction roller 4.

The tension roller 43 in Fig. 8 may in addition be provided with longitudinal grooves, in order for the suction air caused by the nozzles 9 to pass through the fibre conveying channel 8.1.

The possibility likewise pertains of designing the tension roller 43 as a perforated hollow roller, so that the air can pass through the perforation from the space between the rollers 2 and 3 into the fibre conveying channel 8.1.

The advantage of such a roller further pertains in that, due to air passing from the inside of the roller through the perforation into the fibre conveying channel 8.1, the fibres are actively released from the surface.

A further variant consists of provided the surface of the roller part 43.2 with fine circumferential grooves, which likewise allow for air permeation.

As far as the terms "core yarn fibres" and "cover yarn" are concerned, it may further be mentioned that there is no precise delimitation between "core yarn fibres" and "cover yarn", since the rotation of the fibres in the yarn of "non-rotated" or "scarcely-rotated" fibre parts in the interior of the yarn gradually grows to the "most thickly rotated" fibres or fibre parts at the circumference of the yarn. Instead of "core yarn fibers" and "cover yarn", it is also possible to speak of fibres or fibre areas which tend to be located in the interior, and of fibres or fibre areas which, by contrast, tend to be located against or at the circumference of the yarn.

There is likewise no restriction with regard to the length of the fibres or fibre areas which tend to be located in the interior or at the circumference of the yarn.

Within the scope of this spinning process, incidentally, the term "migration" of the fibres or of the fibre areas is also used in the context of the build-up of the yarn, in which, seen in the direction of run, front areas of the fibres tend to be located in the interior area of the yarn and the rear part of the fibre tends to be located in the outer area of the yarn. This so-called "migration" or "build-up" of the yarn provides the advantageous nature and quality of these yarns.

Lastly, reference may be made to the fact that a strip division, as shown in Figures 6, 6b, 7 and 7b, can be obtained by the use of a suction roller 4, because in the

areas 16 (Figure 6, 6b) and 18 (Figure 7, 7b) no air is sucked in, with the result that the fibre strip is divided into the areas 12 and 13 (Figure 6, 6b) or into the areas 12.1, 13.1, and 19 (Figure 7, 7b). The same applies to the arrangement of Figure 9 and Figure 8, if a suction roller 4 is used in the arrangement of Figure 8 instead of the roller 3, which is hereby proposed as a variant for this Figure 8.

In the arrangement of Figure 8 shown, two small parallel strips with different middle fibre lengths are guided through the same drafting device, whereby the small fibre strip with the shorter fibres is clamped by the roller 43.2 in the clamping line K.1, while the small fibre strip with the longer fibres is guided in the gap between the roller 43.1 and the fibre guide surface (no identification reference) of the fibre conveying element 10.1.

It should be appreciated by those skilled in the art that modifications and variations can be made to the embodiments of the invention described herein without departing from the scope and spirit of the invention as set forth in the appended claims and their equivalents.